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Factors Related to Employment Outcomes in Vocational Rehabilitation Consumers with Visual Impairments: A Systematic Review

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Abstract

Introduction:

The purpose of this article was to conduct a systematic review of peer-reviewed studies on factors related to employment in consumers who are visually impaired using the Rehabilitation Services Administration Case Service Report (RSA-911) data.

Methods:

We used database, hand, and ancestral search strategies to systematically identify peer-reviewed studies published between 1990 and August 2018 where researchers used RSA-911 data to address the target question. All included articles were coded by two reviewers for study and participant characteristics, quality indicators, and outcomes.

Results:

Nine articles consisting of 14 analyses were included. Twelve analyses concerned employment outcomes; two concerned earnings. Researchers in most studies used large samples of 3,000 or more consumers and used multivariable analyses, most commonly multilevel logistic regression. Factors that consistently predicted lower employment across studies included presence of a secondary disability and legal blindness; higher education level consistently predicted higher employment, as did earnings and self-support at vocational rehabilitation (VR) application. Few analyses included state- or agency- level variables or specific VR services.

Discussion:

These results indicate that certain groups of VR consumers with visual impairments may be at greater risk for unsuccessful closures; researchers should examine specific strategies that may improve outcomes in these groups. These results also highlight the importance of education in securing employment among people with visual impairments. Researchers should examine state-

and agency-level variables that may affect outcomes as well as the effects of specific VR services on outcomes. Additionally, researchers should analyze factors that may affect employment quality as well as employment outcomes.

Implications for Practitioners

Practitioners who are working with consumers with visual impairments who do not have a post-secondary degree should encourage and assist their clients in obtaining one; practitioners may also wish to provide more targeted support for consumers from potentially high-risk subpopulations.

Factors Related to Employment Outcomes in Vocational Rehabilitation Consumers with Visual Impairments: A Systematic Review

In 2016, the employment rate for working-age adults with visual impairments in the United States was only 43.5%, compared to 76.6% for adults without disabilities (Kraus, Lauer, Coleman, & Houtenville, 2018). The full-time/full-year employment rate for working-age adults with visual impairments was even lower at 29.5% (Erickson, Lee, & von Schrader, 2018). Compared to the general U.S. population, individuals with visual impairments also have lower annual earnings, lower annual household income, and higher poverty rates (Erickson et al., 2018). Owing to these discrepancies in employment and income, many individuals with visual impairments seek employment-related services from federal, state, and local agencies, including the State/Federal vocational rehabilitation (VR) system.

Vocational Rehabilitation

In the United States, VR programs assess, plan, develop, and provide services for individuals with disabilities to facilitate engagement in competitive integrated employment and achievement of economic self-sufficiency (U.S. Department of Education, 2016). VR agencies operate in the 50 U.S. states, the District of Columbia, and five U.S. Territories. In some states, one (combined) VR agency serves all consumers with disabilities. Other states have a separate VR agency that serves only individuals with visual impairments plus a general agency that serves individuals with all other disabilities. In these states, general agencies may also serve some individuals with less severe visual impairments or multiple disabilities.

The Rehabilitation Services Administration Case Service Report (RSA-911) datasets provide demographic, service-related, and outcome data for the entire population of VR

consumers whose cases were closed by all VR agencies during a given fiscal year (FY). Individuals with visual impairments comprised approximately 4.4% of the VR population in FY 2015; approximately 24,470 individuals with visual impairments received services from VR agencies (Sui, personal communication, October 19, 2018). Thus, RSA-911 datasets include comparatively large samples of individuals with low-incidence disabilities, including visual impairment, that are difficult to obtain with traditional sampling methods. Accordingly, this data source is particularly valuable to researchers who study employment outcomes.

Previous Reviews

We identified one systematic review of employment-related correlational research focusing on individuals with visual impairments (Goertz, van Lierop, Houkes, & Nijhuis, 2010). This review was relatively broad in nature and focused on qualitative and quantitative studies assessing labor force participation. The six quantitative U.S. studies included in Goertz and colleagues' review were published from 1992 to 1999, had sample sizes ranging from 68 to 431, and did not use RSA-911 data despite the utility of this data source for studying employment in people with disabilities.

Purpose and Aims

The purpose of this study was to conduct a systematic review of RSA-911 studies on predictors of employment for working-age adults with visual impairments. By nature, RSA-911 studies have commonalities such as a consistent data source and consistently defined and measured variables. Conducting a review of only RSA-911 studies will facilitate cross-study comparisons and conclusions due to these studies' inherent commonalities.

The present study contributes to the literature by being the first review of RSA-911 studies focusing on consumers with visual impairments, and by including studies published more

recently and with substantially larger samples than those included in the previous review by Goertz and colleagues (2010). Specifically, our review had the following three aims:

1. Describe the characteristics of RSA-911 studies on predictors of employment for working-age adults with visual impairments.
2. Evaluate the methodological quality of this body of literature.
3. Synthesize the results of this body of literature to identify predictors of employment for VR consumers with visual impairments.

Method

Search Strategy

To identify articles for this review we first conducted a database search of MEDLINE, PSYCINFO, ERIC, Academic Search Premier, Academic Search Complete, and Psychology and Behavioral Sciences Collection in August 2018. Specifically, we searched abstracts using the following search string: (blindness OR "legally blind" OR "vis* impair*" OR "low vision" OR "vision loss") AND ("employ*" OR "work*" or "job*" or "earnings") AND ("predict*" or "correlat*" or "factor*"). This initial search resulted in 2,627 abstracts (reduced to 1,603 when duplicates were removed).

Additionally, we performed targeted searches of *Rehabilitation Counseling Bulletin, Journal of Rehabilitation, Journal of Applied Rehabilitation Counseling, Journal of Rehabilitation Research and Development, International Journal of Rehabilitation Research,* and *Journal of Rehabilitation Administration* using (blindness OR "legally blind" OR "vis* impair*" OR "low vision" OR "vision loss"). We also searched the *Journal of Visual Impairment & Blindness* using ("employ*" OR "work*" or "job*" or "earnings"). We identified 877 additional abstracts through these searches, most of which were duplicates. We also conducted a

hand search of the *Journal of Blindness Innovation and Research,* which yielded 65 abstracts. Finally, we searched the reference lists of included articles and the systematic review by Goertz and colleagues (2010) to identify other articles for consideration. Articles published or indexed after August 2018 may have been excluded in our search.

Inclusion Criteria

We used the following criteria to select articles for inclusion in this review: (a) published in English; (b) published in a peer-reviewed journal; (c) published in 1990 or later; (d) involved quantitative analysis of RSA-911 data; (e) included adults with visual impairments as a specific population of analysis; and (f) included at least one analysis of predictors or correlates of employment or related outcomes (earnings, underemployment, etc.). We excluded articles in which the sole outcome variable was "successful closure" with no distinction between employment closures and uncompensated closures (i.e., homemaker and unpaid family worker). The publication year criterion reflects passage of the Americans with Disabilities Act of 1990, which prohibits discrimination on the basis of disability. Studies involving solely transition-age youth with visual impairments were analyzed in a separate review (Authors, submitted a).

Coding and Data Extraction

Both authors reviewed all articles, and independently extracted and coded data. For articles that included two or more analyses with employment or related outcomes, we coded and reported each analysis separately. For articles that involved both univariate and multivariable analyses of the same variables or included both preliminary and final models, we coded and reported only the multivariable analyses and final models. Specifically, we coded articles for study characteristics (i.e., sample parameters and participant characteristics), quality indicators (QI), and study outcomes. After completion of initial coding for all included articles, we

compared results and resolved all discrepancies through discussion and additional review of the articles in question. Because all coded data was objectively checked against the article text, coding was not blind.

Study characteristics. We coded articles for the following sample parameters: sample size, sample restrictions, FY (for RSA-911 data), additional data sources, inclusion of U.S. territories, inclusion of general agencies, and base rate of competitive employment. For studies that used a subset of agencies (i.e., non-national samples), we also noted the number of agencies involved. Participant characteristics included age, gender, race/ethnicity, severity of visual impairment, and additional disabilities.

Quality indicators. Following best practice guidelines for systematic reviews (Hartling et al., 2017), we developed a set of QIs for assessing methodological quality. We used Thompson, Diamond, McWilliam, Snyder, and Snyder's (2005) QIs for correlational research as a base and modified them in consultation with experts in the field of visual impairment and employment. Both authors rated all studies on the following eight QIs:

- Effect sizes: Reported effect sizes for all predictors (final model)
- Confidence intervals: Provided confidence intervals for all effect sizes (final model)
- Multivariable analyses: Used one or more multivariable analyses (i.e., models with more than one predictor variable) for employment-related outcomes
- Assumptions met: Reported if one or more assumptions of main statistical tests met (final model)
- Longitudinal design: Included variables measured at one time point and outcomes measured at a different time point

- National sample: Involved participants from at least 45 states (i.e., did not restrict to a subsample of states)
- Representative sample: Used a representative, non-convenience sample of the VR consumer population
- Power calculation: Provided a power calculation or other accepted sample size metric for sample sizes of less than 1,200

Study outcomes. For each analysis, we coded the outcome variable, type of statistical analysis, and predictor variables (including statistical significance and effect sizes). We grouped the predictor variables into the following categories: (a) demographic (e.g., age, gender); (b) disability (e.g., severity of visual impairment, secondary disabilities); (c) service (e.g., VR services received, case cost); (d) socioeconomic (e.g., education, employment at application, disability benefits); and (e) agency and state-level variables (e.g., agency type, state unemployment rate). For analyses where homemaker closure was compared to employment closure, we modified the reported outcomes to reflect employment as the target outcome (e.g., by calculating inverse odds ratios [OR]). For analyses of gender and severity of visual impairment, we recalculated ORs where necessary to reflect values for female gender and legal blindness. For analyses that included age as a continuous predictor, we adjusted the ORs as needed so they reflect meaningful units of change by rescaling 1-year age increments to 5-year increments (Hosmer & Lemeshow, 2000).

Outcome Analysis

We used established benchmarks for effect sizes to evaluate practical significance of predictors. Benchmarks for ORs were modified from Rosenthal's (1996) guidelines to give credit for statistically significant ORs below 1.50 and in better accordance with the distribution of

values found in this body of studies (*M*=1.49; *Mdn*=1.17); such modification is recommended in cases where a body of effect sizes can be established (Thompson, 2006). Ninety percent of the ORs in these studies are less than 1.96 (or equivalent reciprocal), and 76.8% are less than 1.50. In our revised benchmarks, ORs of 0.95-1.05 indicate a negligible effect, ORs of 1.06-1.50 (or 0.67-0.94) indicate a small effect; ORs of 1.51-1.99 (or 0.51-0.66) indicate a medium effect; and ORs of 2.00 or higher (0.50 or less) indicate a large effect. We used small, medium, and large benchmarks of 0.1, 0.3, and 0.5 for *phi* effect sizes and .01, .06, and .14 for r^2 effect sizes (Cohen, 1988).

Results

Included Studies and Sample Parameters

Nine studies containing 14 analyses met inclusion criteria (Capella, 2001; Cavenaugh & Rogers, 2002; Darensbourg, 2013; Estrada-Hernandez, 2008; Giesen & Cavenaugh, 2013; Giesen & Hierholzer, 2016; McDonnall, 2016; Steinman et al., 2013; Warren, Giesen, & Cavenaugh, 2004). Three articles were published in the *Journal of Visual Impairment & Blindness*. Of the remaining articles, two were published in the *Journal of Vocational Rehabilitation*, two in the *Journal of Rehabilitation*, one in the *Journal of Applied Rehabilitation Counseling*, and one in *Rehabilitation Counseling Bulletin*.

Data sources. Seven FYs between 1997 and 2011 were represented (see Table 1). Only the FY 2010 and 2011 datasets were used in multiple studies; FY 2010 data was used in five analyses in three studies, and FY 2011 data was used in three analyses in two studies. In two studies (six analyses), researchers used RSA-911 data in conjunction with additional data sources; McDonnall combined the data with survey results from 14-17 agencies, and Steinman

and colleagues combined the data from the 2011 National Survey of State Vocational Rehabilitation Agencies, which contained data from 71 agencies.

Sample size. Thirteen separate consumer samples were used in analyses. The samples ranged from 1,968 to 16,765 consumers (*M*=6,713; *SD*=5,109; *Mdn*=4,478). Three samples had more than 10,000 consumers, and seven had less than 5,000. As expected, the smallest samples came from McDonnall (2016), the only study based on a non-national sample of agencies.

Sample parameters. In six studies representing ten analyses, researchers limited the age range of included consumers (see Table 2). In four studies (representing five analyses), the authors noted including consumers from general VR agencies as well as separate and combined agencies, and two studies (Estrada-Hernandez, 2008; Steinman et al., 2013) included consumers from U.S. territories in three analyses. Consumers from general agencies and U.S. territories comprise a small percentage of VR consumers with a primary disability of legal blindness or other visual impairment; for example, in FY 2015, 3.9% received services from general agencies, and 1.3% received services from agencies in U.S. territories (Sui, personal communication, February 26, 2019). In three studies (Capella, 2001; Estrada-Hernandez, 2008; Warren et al., 2014), researchers limited their samples to consumers with successful closure status, and two studies (Darensbourg, 2013; McDonnall, 2016)—consisting of five analyses—only included consumers who were not employed at application. Finally, two studies (Giesen & Cavenaugh, 2013; Giesen & Hierholzer, 2016) only included participants who were receiving Social Security Disability Insurance (SSDI). Only McDonnall (2016) examined a specific subset of agencies (14-17, depending on the analysis). Sample parameters for each study are provided in Table 1.

Participant Characteristics

Gender was reported for 11 samples, ranging from 42-68% female (*M*=49%; *SD*=7%). Data on race and ethnicity were reported for 11 samples. Samples were generally majority White (65-86%), followed by African American (12-34%, with only two samples under 20%), and Hispanic (7-14%). Consumers from other racial backgrounds (e.g., Asian, American Indian/Alaska Native, multiracial) tended to each make up 2% or less of a given sample, if the data were reported at all.

In terms of severity of visual impairment, two samples included only consumers who were legally blind (code 01), one included only consumers with other visual impairments (code 02), and researchers did not report severity of visual impairment for two samples. In the remaining eight samples, the percentage of consumers who were legally blind ranged from 48-73% (*M*=61%; *SD*=9%). Data on secondary disability status were available for nine samples, two of which were broken down by cognitive and non-cognitive disability. For the other seven samples, the percentage of consumers with secondary disabilities ranged from 9-43% (*M*=36%; *SD*=12%). See Table 2 for participant characteristics for each sample.

Outcome Variables and Statistical Analyses

The most common outcome was competitive employment (*n*=11), followed by weekly earnings (*n*=2), and competitive or supported employment (*n*=1). In two of these analyses (Estrada-Hernandez, 2008; Warren et al., 2004), researchers compared employment outcome to homemaker closure. For analyses in which competitive employment was the outcome variable, competitive employment rates in the samples ranged from 24-76% (M=49%; SD=13%), with only two samples above 51%, and one sample below 43% (see Table 1). The statistical analyses used were hierarchical generalized linear modeling (i.e., multilevel logistic regression; *n*=8), multiple logistic regression (*n*=2), stepwise multiple regression (*n*=2), multiple linear regression

(*n*=1), and chi-square analysis (*n*=1). The two analyses of a continuous outcome variable (i.e., weekly earnings) used stepwise and multiple linear regression analyses; one analysis of the categorical variable of competitive employment also used a stepwise multiple regression analysis. Because of the analyses used, ORs were the most common effect size (*n*=10 analyses). Table 3 includes detailed information about outcome variables, statistical analyses, and predictors.

Quality Indicators

Because all studies used samples of greater than 1,200 consumers, all were assessed on the other seven QIs, as described previously (see Table 4). The number of QIs met ranged from 2-5 (*M*=3.6; *SD*=1.0). All nine studies used multivariable analyses, eight used a national sample, five used a representative sample, four reported effect sizes for all predictors, four reported if assumptions of their main statistical tests were met by the data, and two reported confidence intervals for all effect sizes. Given the nature of the RSA-911 data, none of the analyses were longitudinal. As expected, there were similar strengths in sample and analyses across studies but some common weaknesses in the reporting of results.

Factors Related to Outcomes

Participant characteristics. The effects of gender on competitive employment varied in the 11 analyses in which it was included (OR=0.43-1.05). Female gender had a significant negative effect on employment in four analyses (OR=0.43-0.79), which indicates that the odds of employment were 21-57% lower for women compared to men. Female gender had a small negative effect on earnings in one additional analysis (r^2=.02).

African American race was included in eight analyses of competitive employment and was a significant negative predictor in two (OR=0.67-0.70). Hispanic ethnicity was included in

eight analyses (OR=0.90-1.21) and it was not a significant predictor in any of them. Asian race was included in six analyses (OR=0.31-1.39) and it was a negative and significant predictor of competitive employment in one (OR=0.31). In that analysis, the authors also reported a large Asian race by agency type interaction effect (OR=4.70), whereby Asian consumers had much better outcomes when served by separate agencies versus combined or general agencies. In the one analysis that included race as a predictor of earnings, consumers who were White had significantly higher weekly earnings at closure (effect size not reported).

Researchers examined age as a continuous predictor of employment in ten analyses. Age was a significant but small or negligible predictor in nine of those (OR=0.70-1.10 per 5-year increment). In one analysis that used age bands rather than examining age as a continuous variable, being age 36 or younger had a significant medium positive effect on employment (OR=3.06). The size of the OR obtained in this particular analysis may be a reflection of the larger-sized age bands (compared to smaller increments for the other analyses). Age was also significantly related to weekly earnings in two analyses, once negatively and once positively.

Disability characteristics. Researchers examined relationships between severity of visual impairment and employment in eight analyses (OR=0.50-0.84); legal blindness was a significant negative predictor of employment in six analyses, with effect sizes ranging from small to large. Secondary disability as a general category was a significant negative predictor in all eight analyses in which it was included (OR=0.51-0.66). In two additional analyses, researchers examined cognitive and non-cognitive secondary disability separately. In one analysis, they found that non-cognitive disability had a significant negative relationship with employment (OR=0.69) but that cognitive disability was not significant (OR not reported);

researchers did not report statistical significance or effect sizes for either type of secondary disability for the other analysis.

Socioeconomic variables. Ten analyses of competitive employment included level of education. Education level tended to have a small, significant positive effect on competitive employment whether examined as a continuous variable (*n*=6 analyses; OR=1.11-1.22) or by comparing a high school diploma versus less than a high school diploma (*n*=2; OR=1.22-1.49); it had a small or medium, significant effect when comparing more than a high school diploma versus high school diploma (*n*=2; OR=1.29-1.97). Education level was a non-significant predictor of employment in only one analysis, and statistical significance was not reported for one additional analysis. Education level also had a small significant effect on earnings in two analyses (r^2=.05-.08).

Six analyses included receipt of SSDI at application, with four of them yielding significant, negative effects on competitive employment (OR=0.48-0.81). In one analysis of only SSDI recipients, SSDI amount was positively associated with competitive employment (OR=1.05 per $200). Five analyses included receipt of Supplemental Security Income (SSI) at application, four of which yielded significant negative effects on competitive employment (OR=0.56-0.69) and one of which yielded a non-significant, non-reported effect. In one analysis, researchers combined SSI and SSDI receipt and found no significant effects on competitive employment (OR not reported). Receipt of Medicaid at application was significantly negatively linked to competitive employment (OR=0.48) in the one analysis in which it was examined.

Of the five analyses that included earnings or self-support at application, four yielded significant positive effects on competitive employment (OR=1.42-15.40), and researchers did not report statistical significance for one analysis. For earnings at application, the odds of

employment would increase by 42% for each $50 increase in weekly earnings at VR application (which equates to 4.07 times higher odds per $200 in weekly earnings); consumers with any weekly earnings at application had 15.40 times higher odds of employment than those without earnings. Furthermore, self-support at application was associated with 6.25 times higher odds of employment (versus homemaker closure) compared to other types of support. One additional analysis included any previous employment, which had a significant positive effect (effect size not reported).

Service characteristics. In three analyses, researchers examined service costs in relation to competitive employment; one found a significant positive effect (effect size not reported). In the other two, researchers found a non-significant effect at the consumer level. Two additional analyses indicated that service cost was significantly positively associated with weekly earnings. One analysis, which was limited to SSDI recipients, included specific VR services as predictors; job-related services (OR=1.87) were significantly related to competitive employment, especially on-the-job supports (OR=4.06), job placement assistance (OR=2.30), and job search assistance (OR=1.78). Special and remedial services (e.g., reader, personal attendant, basic academic remedial or literacy training), on the other hand, were significantly negatively related to competitive employment (OR=0.82). Referral source other than self was significantly negatively related to competitive employment in one analysis (OR=0.49).

State and agency characteristics. In five analyses, researchers examined relationships between type of agency (i.e., separate agency v. general/combined agencies) and employment. These analyses generally yielded non-significant findings; one univariate analysis yielded a significant but negligible effect size. In one analysis, researchers found a small, positive interaction effect (OR=1.08) in which older applicants had slightly better competitive

employment outcomes when served by separate agencies, although this analysis only included consumers who received SSDI. The same analysis also yielded a negligible (OR=1.03) interaction effect between female gender, separate agency status, and state population. In two additional analyses, researchers examined relationships between agency type and earnings, with one finding no effect and one finding a significant positive effect for combined/general agencies. Six analyses included state unemployment rate (OR=0.89-1.28), with one yielding a significant negative effect on competitive employment (OR=0.89). Other state-level variables were generally not significant and were analyzed only in a small handful of studies. For example, McDonnall (2016) found that engagement in specific business relation practices by VR counselors was a small but statistically significant predictor of competitive employment in two analyses (OR=1.11-1.13). Similarly, engagement in business-specific interaction practices by business relations professionals was a small but statistically significant predictor of competitive employment in two analyses (OR=1.18-1.25). In another set of analyses, Steinman and colleagues (2013) found that agency decision-making control over policies and procedures was significantly associated with competitive employment in consumers who are legally blind (OR=2.64) but not those who are visually impaired (OR=0.95). They also found that ORs for average costs at the agency level were non-significant.

Discussion

We conducted a systematic review of published studies in which researchers used RSA-911 data to examine employment in people with visual impairments; nine studies consisting of 14 analyses were reviewed. Education generally produced statistically significant, small positive effects, and self-support or earnings at application generally yielded large, positive effects on employment. In contrast, disability-related variables generally produced consistent negative

effects on employment; effects for legal blindness ranged from small to large, and effects for secondary disability were medium. Receipt of SSI or SSDI tended to produce consistent negative effects on employment outcomes. Effects of gender were mixed, with some analyses indicating a small to large relative disadvantage for female consumers compared to males, and other analyses indicating no gender differences at all. Some of the variation in gender effects (or the lack thereof) may relate to changing social attitudes and norms around female gender given that the studies yielding no gender effects had samples from FY 2010 and 2011 data. However, it is also important to note that these samples tended to be comparatively smaller and consist of specific subpopulations (i.e., consumers from a certain subset of agencies or SSDI recipients only), which may have reduced the likelihood of finding small but statistically significant gender effects. Thus, more research using data from later FYs is needed to clarify any possible change in the effects of gender on employment.

In general, agency type did not have a significant effect on outcomes, and few analyses incorporated other state- or service-level variables. Given that the analyses that incorporated multilevel interaction effects yielded some significant interaction effects between agency type and consumer variables, researchers may want to include cross-level interactions in future analyses.

Although not surprising, these results again speak to the importance of providing individuals with visual impairments with services, accommodations, and other supports to facilitate educational advancement and paid employment, including support for job retention and advancement. In the one analysis of provision of specific types of VR services, job-related services were the stronger predictor of employment, providing tentative evidence that these services can help individuals with visual impairments who receive SSDI obtain competitive

employment; researchers should replicate these analyses in the broader population of consumers with visual impairments. Additionally, earnings, self-support, and SSDI amount at application were significant predictors of employment, all of which are indicative of previous employment. These results correspond well to the findings in the transition-age population of individuals with visual impairments, where paid work experience similarly predicts higher rates of post-school employment (Authors, submitted a; McDonnall, 2011).

Unlike previous systematic reviews (Goertz et al., 2010; Authors, submitted a,b), we found consistent negative relationships between employment and disability-related variables like severity of visual impairment and secondary disability. This discrepancy is potentially due to a number of factors. First, because all studies in this review utilized the same primary data source, operational definitions of variables were consistent across allowing for consistent comparisons across analyses. Such comparisons are much more difficult when studies use a variety of definitions and terms. Second, the use of the RSA-911 data allowed for very large sample sizes relative to other studies of this population (Goertz et al., 2010; Authors, submitted a,b). These larger sample sizes may have facilitated the detection of small but statistically significant factors that may not have been evident in analyses with smaller sample sizes.

Limitations of the Literature and Implications for Future Research

Despite the considerable advantages of the RSA-911 data, they present some limitations that should be discussed. First, these results only concern individuals who were engaged with the State/Federal VR system and thus may not generalize to other populations of people with visual impairments, such as those in other countries, those who only receive services from private VR agencies, and those who do not receive any VR services. Second, researchers using RSA-911 data are largely limited to the variables contained in the dataset, which restricts the questions that

can be asked and answered; some researchers (e.g., McDonnall, 2016; Steinman et al., 2013) have attempted to mitigate this limitation by combining the RSA-911 dataset with other data sources. Although it would be difficult to supplement data on the individual level, one can combine individual data with additional state- and agency-level data to expand the potential scope of analyses. Third, researchers examined earnings as an outcome variable in only two analyses in this review, highlighting the lack of systematic knowledge about other aspects of employment in VR consumers with visual impairments. Researchers should examine factors that predict not only employment but also earnings, especially in more recent datasets. Additionally, researchers could expand this area of analysis by creating composite outcome variables, such as job quality indices (e.g., Cimera, Rumrill, Chan, Kaya, & Bezyak, 2015; McDonnall & Cmar, 2018), to better understand the quality and nature of employment outcomes. Fourth, the RSA-911 data ends at case closure, making it difficult to track longitudinal outcomes, such as job retention among consumers with a competitive employment closure. Longitudinal outcome data would allow researchers to investigate predictors of sustained, long-term employment. Finally, researchers should report effect sizes and confidence intervals across all studies to aid in interpretation of practical significance (Thompson et al., 2005), especially with large sample sizes such as those used in this body of literature. Additionally, two analyses in this review employed stepwise regression, an analysis technique that has been criticized on methodological and statistical grounds (Thompson, 1995). Although this technique was not commonly used in this body of literature and the results of the analyses in which it was used were not markedly different from those that employed multilevel logistic regression, researchers may wish to avoid using stepwise regression in future analyses.

Implications for Policy and Practice

As discussed previously, these results highlight the importance of providing support and accommodations to facilitate education and promote future and continued competitive employment in people with visual impairments. They also highlight potential "high-risk" subgroups of people with visual impairments, such as people with secondary disabilities and SSI/SSDI recipients, who may need additional, targeted supports to achieve competitive employment. Consumers from these groups may benefit from additional job-focused supports as well as supports that address specific disability-related, societal, and socioeconomic barriers faced by these particular groups.

Additionally, these results highlight the value of the RSA-911 datasets in understanding the factors that predict employment in people with visual impairments. The public availability of these datasets for analyses allows for a comprehensive and detailed examination of how to best serve this low-incidence but high-need population. The ability to analyze data at the VR consumer population level greatly adds to our ability to truly assess the context of employment in people with visual impairments without concerns about issues such as sampling bias and unrepresentative samples. Recent changes to the RSA-911 data, including new variables and increased frequency of reporting, could provide opportunities for researchers to expand their analyses and generate new knowledge about this population. However, confidentiality concerns have led to uncertainty regarding future availability of RSA-911 data to researchers. Continued availability of these data to researchers is vitally important for informing policy and practice with quality, comprehensive data. Along those same lines, researchers should advocate for continued access to RSA-911 data and continue analyzing these data from more recent years to see if the results found in these studies still hold true, especially given the dramatic impact of the Workforce Innovation and Opportunity Act (WIOA; 2014) on many VR policies and practices,

including those that may disproportionately affect consumers with visual impairments (McDonnall, Crudden, & Steverson, 2018).

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Table 1

Sample Parameters

Study	Sample size	Sample restrictions	FY	Additional VR agency survey data	Included U.S. territories	Included general agencies	Competitive employment rate for sample
Capella (2001)	16,270	Successful closure only	1997	N	N	N	NA
Cavenaugh & Rogers (2002)	8,676	N/A	1998	N	NR	NR	24%
Darensbourg (2013)	3,610	Not employed at application	2006	N	NR	Y	76%
Estrada-Hernandez (2008)	16,765	Successful closure only	2002	N	Y	Y	67%[a]
Giesen & Cavenaugh (2013)	4,478	SSDI recipients	2010	N	NR	Y	43%
Giesen & Hierholzer (2016)	3,610	SSDI recipients	2011	N	N	N	45%
McDonnall (2016)[b]	2,414	Not employed at application	2010	Y (16 agencies)	N	N	43%
McDonnall (2016)[c]	1,968	Not employed at application	2011	Y (14 agencies)	N	N	50%
McDonnall (2016)[d]	2,598	Not employed at application	2010	Y (17 agencies)	N	N	47%
McDonnall (2016)[e]	2,402	Not employed at application	2011	Y (17 agencies)	N	N	51%
Steinman et al. (2013)	6,751	Legally blind only	2010	Y[f] (71 agencies)	Y	Y	45%
Steinman et al. (2013)	6,990	Visually impaired only	2010	Y[f] (71 agencies)	Y	Y	62%
Warren, Giesen, & Cavenaugh (2004)	10,736	Legally blind, had IPE, and successful closure	2001	N	NR	NR	NR

Note. FY=fiscal year; VR=vocational rehabilitation; N=no; NA=not applicable (weekly earnings outcome analysis); NR=not reported; Y=yes; SSDI=Social Security Disability Insurance; IPE=Individualized Plan for Employment.

[a]includes competitive or supported employment. [b]Rehabilitation counselor model 1. [c]Rehabilitation counselor model 2. [d]Business relations staff model 1. [e]Business relations staff model 2. [f]2011 National Survey of State Vocational Rehabilitation Agencies data.

Table 2
Participant Characteristics

Study	Age (in years)	Female	Race/ethnicity	Legally blind	Secondary disability
Capella (2001)	*M*=53.61 (*SD*=18.86)	NR	NR	NR	NR
Cavenaugh & Rogers (2002)	55 and older Women: *M*=72[a] Men: *M*=67[a]	68%	86% White 12% African American 1% Asian/Pacific Islander <1% American Indian/Alaska Native	67%	NR
Darensbourg (2013)	24% 36 or younger 31% 37-50 47% 51-65	52%	78% White	48%	NR
Estrada-Hernandez (2008)	17-101 *M*=52.6 (*SD*=18.4)	55%	77% White 18% African American 10% Hispanic 1% Asian <1% American Indian/Alaska Native <1% Hawaiian/Pacific Islander	NR	9%
Giesen & Cavenaugh (2013)	18-75[a] *M*=46.21 (*SD*=11.54)	47%	65% White 25% African American 8% Hispanic 1% Asian 1% multiple races <1% American Indian/Alaska Native <1% Hawaiian/Pacific Islander	73%	3% cognitive 41% non-cognitive

Giesen & Hierholzer (2016)	18-75[a] *M*=47.3 (*SE*=0.19)	45%	65% White 24% African American 7% Hispanic 1% Asian 1% multiple races 1% American Indian/Alaska Native <1% Hawaiian/Pacific Islander	73%	3% cognitive 40% non-cognitive
McDonnall (2016)[c]	22-64[a] *M*=46.22 (*SD*=11.34)[b]	45%	32% African American 13% Hispanic 2% Asian 2% other	59%	43%
McDonnall (2016)[d]	22-64[a] *M*=46.47 (*SD*=11.37)[b]	42%	32% African American 14% Hispanic 2% Asian 2% other	54%	43%
McDonnall (2016)[e]	22-64[a] *M*=46.38 (*SD*=11.43)[b]	45%	32% African American 13% Hispanic 2% Asian 2% other	58%	42%
McDonnall (2016)[f]	22-64[a] *M*=46.65 (*SD*=11.52)[b]	45%	34% African American 13% Hispanic 2% Asian 2% other	56%	43%
Steinman et al. (2013)[g]	22-65 *M*=44.6 (*SD*=11.4)	47%	73% White 24% African American 12% Hispanic 3% other	100%	39%

Steinman et al. (2013)[h]	22-65 *M*=47.4 (*SD*=11.3)	49%	73% White 24% African American 11% Hispanic 3% other	0% (all visually impaired)	35%
Warren, Giesen, & Cavenaugh (2004)	Total NR	Total NR	Total NR	100%	Total NR

Note. NR=not reported; FY=fiscal year.
[a]At application. [b]At closure. [c]Rehabilitation counselor model 1. [d]Rehabilitation counselor model 2. [e]Business relations staff model 1. [f]Business relations staff model 2. [g]Legally blind model. [h]Visually impaired model.

Table 3
Study Outcomes

Study	Outcome variable	Statistical analysis	Predictors and effect sizes (by category)				
			Demographic	Disability	Service	Socioeconomic	Agency & state
Capella (2001)	Weekly earnings	Multiple linear regression	*Age: .13		*Service cost: .02 *Months case was open: .00 *Number of services received: .00	*Education level: .05	Separate agency[a]: .00
Cavenaugh & Rogers (2002)	Competitive employment	Stepwise multiple regression	*Age at application: nr (neg) !Ethnicity *Female gender: nr (neg) !Marital status !Race	*Legally blind: nr (neg) !Onset of vision loss *Secondary disability: nr (neg)	!Number of services received *Service cost: nr (pos) *Shorter service duration: nr (neg)	!Education *Previous employment: nr (pos) *Self-support at application: nr (pos)	
Darensbourg (2013)	Competitive employment	Multiple logistic regression	*Age (0-36): 3.06 Age (37-50): nr !Age (51-65) *Female gender: 0.53 Race and ethnicity: nr	*Legally blind: 0.50 Mental impairment: nr !Secondary disability	*Referral source other than self: 0.49	Education at closure (elementary): nr !Education at closure (postsecondary) Education at closure (secondary): nr IEP: nr	

						!Living arrangement at application *Medicaid: 0.48 SSI or SSDI: nr !Type of secondary education *Weekly earnings at application (any): 15.40	
Estrada-Hernandez (2008)	Weekly earnings	Stepwise multiple regression	!African American *Age: .12 (neg) !AI/AN !Asian *Female gender: .02 (neg) !Hawaiian/Pacific Islander !Hispanic *White: nr (pos)	!Secondary disability !Severe disability	*Number of services received: nr (neg) *Service cost: nr (pos) *Service duration (months): nr (neg)	*Education level at application: .08 (pos)	*Combined/general agency[b]: nr (pos)
Estrada-Hernandez (2008)	Competitive or supported employment (vs. homemaker)	Chi-square					*Combined/general agency[b]: .02

Giesen & Cavenaugh (2013)	Competitive employment	HGLM	African American[c]: nr *Age at application: 0.93 *Age at application*separate agency[d]: 1.08 !AI/AN *Asian[c]: 0.31 *Asian[c]*separate agency[d]: 4.70 Female gender: nr *Female gender*state population: 0.96 !Hawaiian/Pacific Islander[c] Hispanic: nr Multiple race[c]: nr	Cognitive secondary disability: nr *Legally blind: 0.76 *Non-cognitive secondary disability: 0.69 *Non-cognitive secondary disability*state per capita income: 0.97 (per $1,000)		*Earnings at application: 1.42 (per $50) *Education level at application: 1.17 *SSDI amount at application: 1.05 (per $200) SSI at application: nr	*Separate agency[d]: nr* *State per capita income: nr* *State population: nr* *State population*separate agency[d]*gender: 1.03 *Unemployment rate: 0.89 *Unemployment rate*separate agency[d]: 0.97
Giesen & Hierholzer (2016)	Competitive employment	HGLM	*Age at application: nr* *Gender: nr* *Race and ethnicity: nr*	*Cognitive secondary disability: nr* *Legally blind: nr* *Non-cognitive secondary disability: nr*	Evaluation services: nr *Job-related services: 1.87 *Job-related services*state per capita income: 1.04 *Job-related services*state unemployment rate: 1.08	*Education level: nr* *SSDI amount at application: nr* *Weekly earnings: nr*	*Separate agency[a]: nr* *State per capita income: nr* *State population: nr* *Unemployment rate: nr*

					*Special and remedial services: 0.82 *Training and supports: 1.10		
McDonnall (2016)	Competitive employment (Rehabilitation counselor model, FY 2010)	HGLM	African American: 0.94 *Age at closure: 0.95 Asian: 1.05 Female gender: 0.85 Hispanic: 1.18 Other race: 0.57	Legally blind: 0.84 *Secondary disability: 0.60		*Education level: 1.20 SSDI: 0.92 *SSI: 0.56	*BRS: 1.11 !BSIP *Employment-population ratio: 1.11 State per capita income: 1.00 Unemployment rate: 1.28
McDonnall (2016)	Competitive employment (Rehabilitation counselor model, FY 2011)	HGLM	African American: 1.03 *Age at closure: 0.95 Asian: 1.21 Female gender: 1.05 Hispanic: 1.15 Other race: 0.97	*Legally blind: 0.63 *Secondary disability: 0.58		*Education level: 1.15 SSDI: 0.92 *SSI: 0.69	*BRS: 1.13 !BSIP Employment-population ratio: 1.03 State per capita income: 1.00 Unemployment rate: 1.11
McDonnall (2016)	Competitive employment (Business relations staff model, FY 2010)	HGLM	African American: 0.87 *Age at closure: 0.95 Asian: 1.06 Female gender: 0.83 Hispanic: 1.21 Other race: 0.61	*Legally blind: 0.79 *Secondary disability: 0.61		*Education level: 1.22 *SSDI: 0.73 *SSI: 0.58	BRS: 1.04 *BSIP: 1.18 Employment-population ratio: 0.98 State per capita income: 1.00 Unemployment rate: 1.02

McDonnall (2016)	Competitive employment (Business relations staff model, FY 2011)	HGLM	African American: 0.99 *Age at closure: 0.95 Asian: 1.39 Female gender: 1.03 Hispanic: 1.05 Other race: 0.83	*Legally blind: 0.72 *Secondary disability: 0.66		*Education level: 1.12 *SSDI: 0.81 *SSI: 0.62	BRS: 1.03 *BSIP: 1.25 Employment-population ratio: 0.93 State per capita income: 1.00 Unemployment rate: 0.99
Steinman et al. (2013)	Competitive employment (Legally blind model)	HGLM	*African American[c]: 0.70 *Age: 1.05 *Female gender: 0.79 Hispanic: 0.90 Other race[c]: 0.83	*Secondary disability: 0.51	*Number of services received: 1.13 Service cost (high): 1.14	*Greater than HS diploma[g]: 1.97 *Less than HS diploma[g]: 0.67 *SSDI at application: 0.70	HR: 0.86 Infrastructure: 0.89 Management information systems: 1.37 *Policies and procedures: 2.64 Program evaluation: 1.14 Purchasing: 0.73 Separate agency[d]: 1.33 Service cost (high): 0.98
Steinman et al. (2013)	Competitive employment (Visually impaired model)	HGLM	*African American[c]: 0.67 *Age: 1.10 Female gender: 0.92 Hispanic: 1.14 Other race[c]: 0.77	*Secondary disability: 0.51	*Number of services received: 1.07 Service cost (high): 1.06	*Greater than HS diploma[g]: 1.29 *Less than HS diploma[g]: 0.82 *SSDI at application: 0.48	*HR: 0.56 Infrastructure: 1.07 Management information systems: 1.05 Policies and procedures: 0.95 Program evaluation: 1.10 Purchasing: 0.92

						Separate agency[d]: 1.55 Service cost (high): 0.57
Warren, Giesen, & Cavenaugh (2004)	Competitive employment (vs. homemaker)	Multiple logistic regression	African American[c]: 1.06 *Age at application: 0.70 AI/AN[c]: 2.00 Asian and Pacific Islander[c]: 0.81 Divorced[h]: 1.00 *Female gender: 0.43 Hispanic: 1.03 Never married[h]: 0.95 Separated[h]: 1.18 *Widowed[h]: 0.46	*Secondary disability: 0.51	*Education level: 1.11 *Self-support at application: 6.25	

Note. Statistical significance was not reported for italicized predictors. Odds ratios for age reflect 5-year increments. *=statistically significant; !=not included in final model; nr=not reported; neg=negative; pos=positive; IEP=Individualized Education Program; SSI=Supplemental Security Income; SSDI=Social Security Disability Insurance; AI/AN=American Indian/Alaska Native; HGLM=hierarchical generalized linear modeling (i.e., multilevel logistic regression); FY=fiscal year; BRS=Business Relations Scale; BSIP=Blindness-specific interaction practices; HS=high school; HR=human resources.
[a]Reference group=combined agency. [b]Reference group=separate agency. [c]Reference group=White. [d]Reference group=combined/general agency. [e]Reference group=not employed. [f]Reference group=less than HS degree. [g]Reference group=HS diploma. [h]Reference group=married.

Table 4
Quality Indicators (QIs)

Study	ES	CI	MA	AM	LD	NS	RS	PC	QIs met
Capella (2001)	Y	N	Y	N	N	Y	Y	N/A	4
Cavenaugh & Rogers (2002)	N	N	Y	N	N	Y	N	N/A	2
Darensbourg (2013)	N	N	Y	N	N	Y	Y	N/A	3
Estrada-Hernandez (2008)	N	N	Y	Y	N	Y	Y	N/A	4
Giesen & Cavenaugh (2013)	N	N	Y	Y	N	Y	N	N/A	3
Giesen & Hierholzer (2016)	N	N	Y	Y	N	Y	N	N/A	3
McDonnall (2016)	Y	Y	Y	N	N	N	N	N/A	3
Steinman et al. (2013)	Y	Y	Y	N	N	Y	Y	N/A	5
Warren, Giesen, & Cavenaugh (2004)	Y	N	Y	Y	N	Y	Y	N/A	5
Total (studies meeting each QI)	**4**	**2**	**9**	**4**	**0**	**8**	**5**	**-**	

Note. ES=Effect sizes; CI=Confidence intervals; MA=Multivariable analyses; AM=Assumptions met; LD=Longitudinal design; NS=National sample; RS=Representative sample; PC=Power calculation; Y=yes; N=no.